EOLID MOLLUSCA FROM GHANA, WITH FURTHER DETAILS OF WEST ATLANTIC SPECIES

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ABSTRACT

Three species of eolid nudibranchs are described from Ghana. *Learchis poica* is also known from the Caribbean; *Catriona tema*, n. sp., is closely related to the Caribbean *C. maua*; and *Berghia verrucicornis* is also known from southern Europe. Jamaican specimens of *Berghia* are re-examined in an attempt to allocate them to their correct species, but more material is required before this can be done satisfactorily.

INTRODUCTION

This paper describes three species of eolid nudibranchs collected between Accra and Tema in Ghana. All three are very similar to species found in Jamaica in 1961-62 (Edmunds, 1964), and it has been necessary to re-examine this material more thoroughly in order to decide whether the Ghanaian and the Jamaican animals are conspecific or distinct.

Order NUDIBRANCHIA
Suborder *EOLIDACEA*
Tribe ACLEIOPROCTA
Family Cuthonidae

Catriona tema, n. sp.

Figs. 1; 2; 3, A

Occurrence.—One specimen was found on the gymnoblast hydroid *Halocordyle disticha* (Goldfuss) (determined by W. J. Rees) at low water at Teshie, between Accra and Tema, on December 4, 1964. The holotype is a series of sections fixed in Heidenhain's "Susa," stained with Masson's trichrome, at the British Museum (N.H.), reg. No. 1966466.

Description.—The living animal was 11 mm long with a pointed tail extending well beyond the last cerata. The rhinophores are 2.0 mm, the oral tentacles 1.5 mm, and the cerata up to 3.0 mm long. The rhinophores are tipped with white and have an orange line up the posterior basal half ending in a ring around the rhinophore (Fig. 1, A, B). The right oral tentacle is tipped with white, but the left one is missing. They arise from a circular oral veil as in *C. maua* Marcus & Marcus. The foot is rounded anteriorly and has no corners. The body is pearl grey in colour. There is a white band across the head in front of the rhinophores and extending back laterally almost to the base of the first ceras. There are white flecks

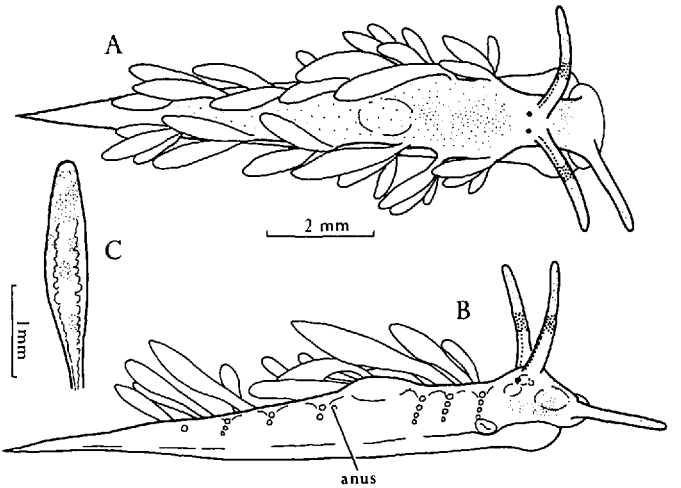

FIGURE 1. *Catriona tema,* n. sp. A, living animal in dorsal view; B, same, in lateral view, with right cerata omitted. In A and B, fine stipple indicates white pigment, coarse stipple indicates orange. C, ceras; close stipple indicates white pigment, spaced stipple indicates white glands.

scattered over the back from the head to the tail, and anterior to the heart these form an almost solid area of white.

There are 40 cerata arranged as follows:

	Anterior liver	Posterior liver
Right side	4, 4, 4	2, 2, 3, 1
Left side	5, 4, 4	2, 2, 2, 1

The penis opens below the anterior row of the right liver, and the anus is acleioproctic (Fig. 1, B). The liver is yellowish, but this is obscured by black and a few orange tubercles. There is a ring of pale-white glands in the cnidosac region as in other species of the genus (Edmunds, 1966), and there are white flecks scattered elsewhere on the cerata (Fig. 1, C).

The jaws (Fig. 2, D) are similar to those of *C. maua* (Marcus & Marcus, 1960), but no black pigment is present. The denticles on the cutting edge are composed of bunches of fine bristles (Fig. 2, E) similar to those of *C. maua.* There are 137 radular teeth with three more in process of formation. The teeth (Fig. 2, A, B) closely resemble those of *C. maua* (Marcus & Marcus, 1960, 1963; Edmunds, 1964). The oldest tooth in the radula (Fig. 2, C) is much longer than the succeeding teeth. Comparison with *C. maua* suggests that this is actually the second tooth and that the first or pre-radular tooth has been lost. This second tooth is 20 μ long in *C. maua,* and 12 μ long in *C. tema.*

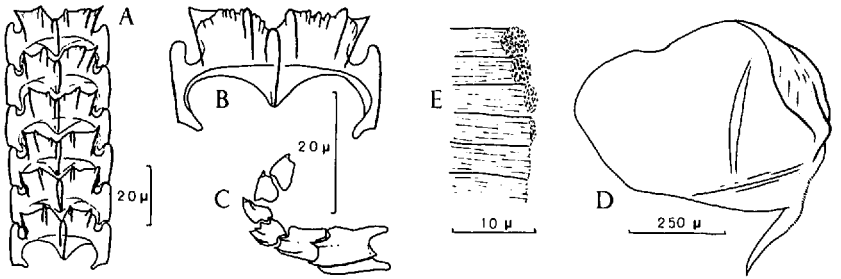

FIGURE 2. *Catriona tema,* n. sp. A, 113th to 118th radular teeth; B, 118th radular tooth, at higher magnification; C, 1st to 6th radular teeth, but the 1st is probably not the pre-radular tooth (see text); D, jaw; E, bristles on cutting edge of jaw.

The reproductive system is basically similar to that of *C. maua* (Edmunds, 1964), but there are differences in the male genital organs. The penial gland of *C. tema* is 1 mm long, whilst that of *C. maua* (in each of three individuals of body length 6 to 9 mm) is only 0.25 mm long. In *C. tema,* the prostate is 650 μ long compared to 450 μ in *C. maua,* whilst the distal non-prostatic part of the vas deferens is 1,000 μ in *C. tema* and only 160 μ in *C. maua* (compare Fig. 3, A of this paper with Fig. 3, A of Edmunds, 1964). Thus the distal non-prostatic part of the vas deferens is 58 per cent of the total length of the vas deferens (from the bifurcation of the spermoviduct to the junction with the penial gland) in *C. tema,* but only 24 per cent in *C. maua.* Obviously, it is desirable to investigate further specimens of both species, but this may prove to be a good distinguishing character. The ampulla of *C. tema* is 600 μ long, the spermatheca 480 μ at its greatest diameter, and the penial stylet 40 μ long.

Discussion.—*C. tema* is closely related to *C. aurantia,* but differs in its pale coloration and in possessing an accessory nematocyst sac in the cerata below the cnidosac. In both of these features it resembles *C. maua* (Edmunds, 1964, 1966). *C. tema* differs from *C. maua* in the following features. The liver of *C. tema* is yellowish, whilst that of *C. maua* is pinkish (Marcus & Marcus, 1963; Edmunds, 1964). (This could be due to a difference in diet, but both species were found on pink hydroids.) *C. tema* has fewer cerata than *C. maua*—only 40 in an animal of 11 mm body length compared with 50, 56, 57, and 59 in four specimens of *C. maua* of body length 7 to 9 mm, and 81 in one specimen of 15 mm. *C. tema* has a longer radula than *C. maua,* with 137 teeth in an 11-mm-long animal compared with 58, 85, 95, and 100 teeth in specimens of *C. maua* of body length 6 to 9 mm, and 80 teeth in an animal of 5 mm length preserved (perhaps 8 mm living) (Marcus & Marcus, 1960). Differences

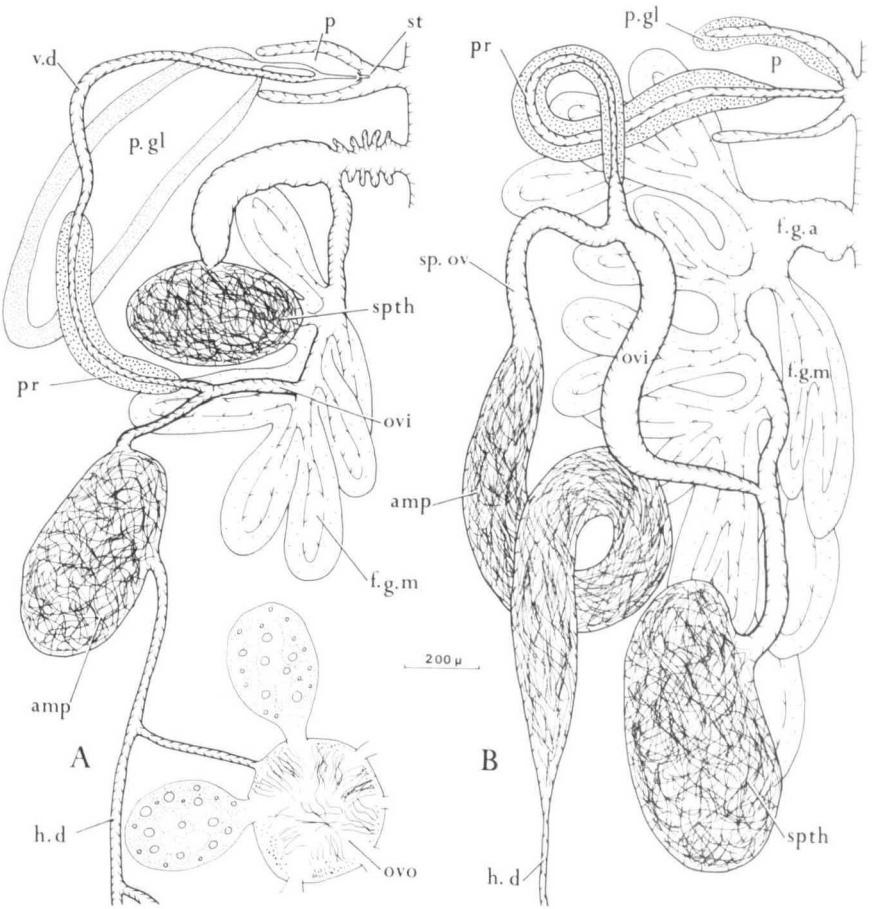

FIGURE 3. Diagrams of reproductive systems. A, *Catriona tema,* n. sp.; B, *Learchis poica* Marcus & Marcus, from Ghana. Lettering: amp, ampulla; f.g.a, female genital atrium; f.g.m, female gland mass; h.d, hermaphrodite duct; ovi, oviduct; ovo, ovotestis; p, penis; p.gl, penial gland; pr, prostate; sp.ov, spermoviduct; spth, spermatheca; st, stylet; v.d, vas deferens.

in the size of the second radular tooth, prostate, vas deferens, and penial gland have already been mentioned. None of these differences appears to warrant specific separation on its own, but taken together I consider they justify separation of the Ghanaian animal from the Caribbean specimens. Further material is obviously desirable to settle the matter.

Following Lemche (1964) and Burn (1964), *Trinchesia* Ihering is a valid name and has priority over *Catriona* Winckworth. Burn maintains

both genera, with *Doris coerulea* Montagu as type species of *Trinchesia,* and *Eolis aurantia* Alder & Hancock as type species of *Catriona.* Burn's (1963, 1964) definition of *Catriona* was based on a knowledge of *C. aurantia* and *C. maua.* Four more species can now be assigned to *Catriona*: *C. tema* n. sp., *Amphorina columbiana* O'Donoghue, 1922, *Cratena gymnota* (Couthouy) (Bergh, 1886), and *Cratena spadix* MacFarland, 1966. It is therefore possible to revise Burn's definition of the genus. *Catriona* is characterized as follows: acleioproct Eolidacea; radula uniseriate with cusp receded and lateral denticles separated by small secondary denticles; pre-radular tooth usually retained and differing markedly from later teeth; denticles on cutting edge of jaw in the form of fine bristles; cerata often raised on slight cushions; short, straight stylet on penis. *C. tema* also has "*cellules spéciales*" and ceratal glands very similar to those described from *C. aurantia* and *C. maua* (Edmunds, 1966), and these characters may perhaps be added to the diagnosis of the genus. All of these features occur in *C. maua* and *C. tema,* but the pre-radula and the cutting edge of the jaw have not hitherto been investigated in *C. aurantia.* I can confirm that *C. aurantia* does have bristles on the cutting edge of its jaw. I have examined radulae from four specimens of *C. aurantia,* each of which has between 48 and 65 teeth. In two of them a pre-radula was not found, although the radulae were mounted with care so as not to break and lose the oldest teeth. The other two, however, do possess a pre-radula similar to that described from *C. maua* (Edmunds, 1964). *C. gymnota, C. spadix,* and *C. columbiana* all have radular teeth of the same shape as those of *C. aurantia* and *C. maua,* but only in *C. spadix,* and possibly in *C. gymnota,* is the pre-radular tooth figured (Bergh, 1886; O'Donoghue, 1922; MacFarland, 1966). Bristles on the cutting edge of the jaws are not recorded for any of these species, but this may be because they have not been looked for. *C. lonca* Marcus (1965) may also be a *Catriona* according to its radula, but the jaws do not appear to carry bristles. *Cuthona alpha* Baba & Hamatani (1963) also has a typical catrionid radula. It could be included in *Catriona* if details of pre-radula and jaws were known, and if the genus were extended to include species without a penial stylet.

When a genus is diagnosed on several characters, it is to be expected that some species will be found which differ in one or more of these characters, yet are obviously closely related to typical species of the genus. Only further information on species of *Catriona* can enable one to decide which characters should be given most weight and which may vary within the genus. At present, it seems likely that the shape of the radular tooth will prove to be a good character for *Catriona,* since this must surely reflect a radically different method of feeding from that used by *Trinchesia* or *Cuthona,* and since species with intermediate teeth are at present

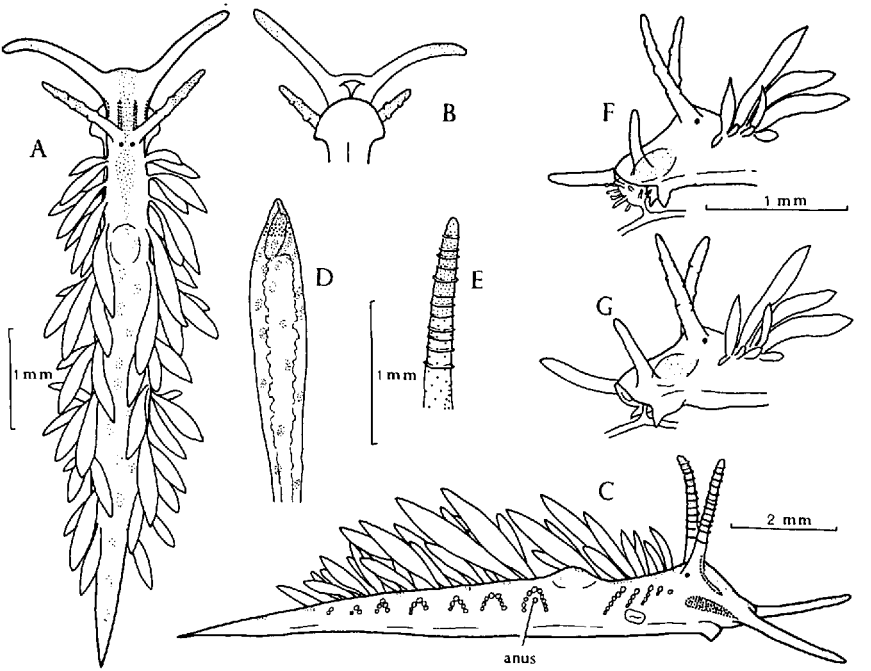

FIGURE 4. *Learchis poica* Marcus & Marcus, from Ghana. A, 6-mm animal, in dorsal view; B, same, in ventral view; C, 12-mm animal, from side, with right cerata omitted; D, ceras; E, rhinophore of 12-mm animal. In A-E, fine stipple indicates white pigment, coarse stipple indicates orange. F and G, 6-mm animal feeding on *Halocordyle disticha*; buccal mass stippled (for further explanation, see text).

unknown. The penial stylet and the pre-radular tooth, however, might very easily be lost in species which are nevertheless closely related to typical members of the genus.

Tribe CLEIOPROCTA
Family Facelinidae
Learchis poica Marcus & Marcus
Figs. 3, B; 4; 5; 6

Occurrence.—Three specimens were found on the hydroid *Halocordyle disticha* (Goldfuss) (determined by W. J. Rees) at low water at Teshie, Ghana, on December 4, 1964.

Further Distribution.—Florida; Jamaica; Curaçao (Marcus & Marcus, 1960, 1963; Edmunds, 1964).

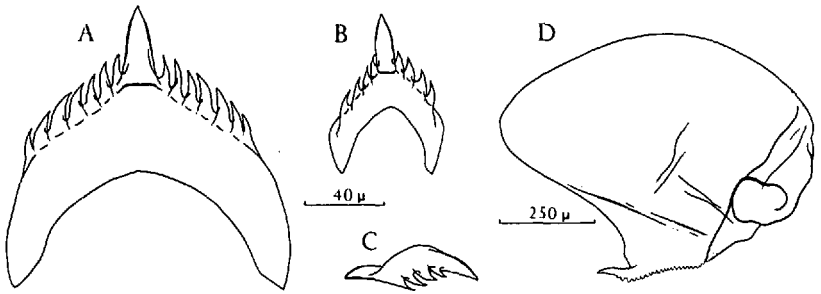

FIGURE 5. *Learchis poica* Marcus & Marcus. A, 12th radular tooth from a 12-mm-long animal which had 12 teeth; B, 3rd tooth from same animal; C, 1st tooth from same; D, jaw from same.

Description.—The animals were up to 12 mm long alive, with a long pointed tail extending well beyond the last cerata. In a 6-mm-long animal, the rhinophores are 1.5 mm, the oral tentacles just over 1.0 mm, and the cerata 2.5 mm long. The larger animals were unhealthy and were never fully extended, so their measurements cannot be given accurately. There are 12 complete rings on the rhinophores of the larger animals, 6 incomplete and irregular rings on those of the smaller animal (Fig. 4, A, C, E). The basal half of the rhinophore is orange; the distal half is grey, dotted with white. The oral tentacles are grey or pale orange at the base, and dotted with white at the tip. The foot is longitudinally grooved, rounded anteriorly, with short corners (Fig. 4, B). The body colour is pearl grey, but in the larger animals the epidermis of the head and part of the back is tinged with orange. There is a mid-dorsal line of white from the front of the head to the heart; farther back, it breaks up into scattered white spots (Fig. 4, A). Orange markings on the head are exactly as found in Jamaican animals (Edmunds, 1964). The yellow lateral line found in some Jamaican animals is absent in Ghanaian specimens. The liver ducts are clearly visible through the dorsal body wall (unlike the Jamaican animals), and both here and in the cerata they are basically cream or pinkish-cream in colour, largely obscured by indigo and blackish marks. The cnidosac is translucent, and the epidermis in this region often has a white ring near the tip with an orange ring just below it. There is a further ring of white dots at the base of the cnidosac, and scattered white dots occur lower down on the cerata (Fig. 4, D).

There are 4 to 6 rows of cerata to the anterior liver and 6 or 7 arches (incomplete posteriorly) to the posterior liver, exactly as in Caribbean animals. Ghanaian animals of body length 6, 11, and 12 mm have respectively 69, 113, and 129 cerata. This compares with Jamaican

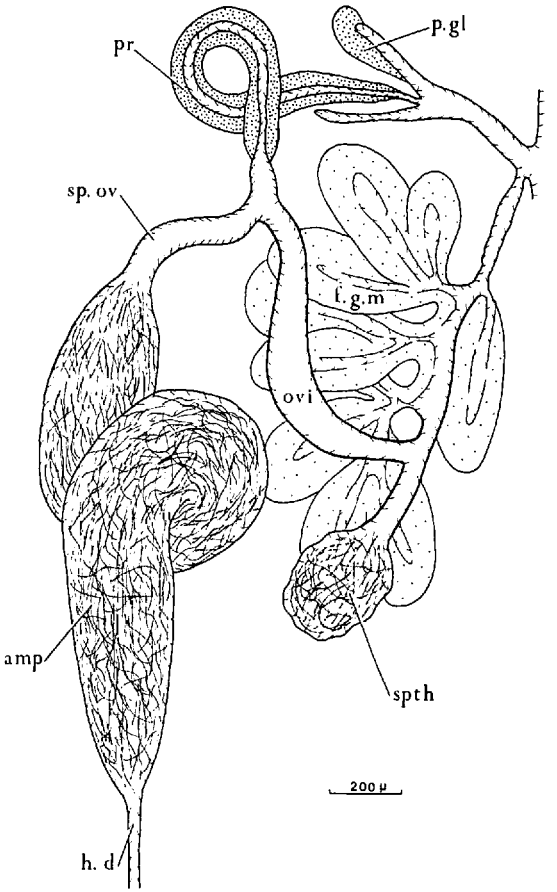

FIGURE 6. *Learchis poica* Marcus & Marcus, from Jamaica. Diagram of reproductive system. Lettering as for Figure 3.

animals of body length 4.5, 7, 9, 12, and 16 mm which have 46, 83, 89, 104, and 127 cerata respectively.

The radular teeth and jaws (Fig. 5) are very similar to those described from Caribbean animals (Marcus & Marcus, 1960).

The reproductive system differs in two respects from the figure given by Marcus & Marcus (1960). The oviduct runs for 1.0 mm between the spermoviduct and its junction with the spermathecal duct (Fig. 3, B), and the spermatheca forms a large sac with a long duct. Because of these

differences, I have re-examined the reproductive system of one of the Jamaican animals (Fig. 6), and find that it is almost identical with that of the Ghanaian animal. The differences in the sizes of the spermatheca and the ampulla are not sufficient on their own to warrant specific separation. The 6-mm-long Ghanaian animal has a similar reproductive system, but all parts are much smaller, the penial gland is rudimentary, the ampulla is empty of sperm, and there is no trace of a spermatheca. It is likely that the animal studied by Marcus & Marcus (1960) was also immature.

L. poica was studied while it fed on *H. disticha* in Ghana and on an unidentified hydroid in Jamaica. The mouth is opened and the buccal mass extended forwards over the hydranth (Fig. 4, F). Then the jaws appear to cut the hydranth, and the buccal mass is retracted (Fig. 4, G).

Discussion.—The differences between Caribbean and Ghanaian specimens are very small, and I therefore regard them as constituting a single species.

Marcus & Marcus (1960) considered *Rizzolia australis* Bergh to belong to *Learchis,* but Burn (1966) showed that it differs from *L. poica* in the arrangement of the cerata and in the penis. Burn regards it as being identical with the favorinid *Austraeolis ornata* (Angas).

Following Marcus & Marcus (1960), the Facelinidae can be separated from the Favorinidae on the basis of the arrangement of the cerata of the anterior liver. The Facelinidae have these cerata arranged in rows, whilst the Favorinidae have them arranged in arches. This system is not entirely satisfactory. Thus *Palisa papillata* Edmunds, 1964 (a synonym of *Moridilla kristenseni* Marcus & Marcus, 1963) is a facelinid, whilst *Noumeaella rehderi* Marcus (1965) is a favorinid, yet both have papillae on the rhinophores, and both have the spermatheca forming a part of the oviduct instead of a separate sac as in most other eolids. Rao (1965) has shown that *Moridilla brockii* Bergh (the type of *Moridilla*) does not have this unusual spermathecal arrangement, so *M. kristenseni* must be transferred either to *Palisa* or to *Noumeaella.* Unfortunately, this cannot be decided until the reproductive system of *Noumeaella curiosa* Risbec (1953) (the type of *Noumeaella*) is known in more detail. The curious spermatheca of *Palisa* may have evolved from something similar to that of *Antonietta luteorufa* Schmekel (1966), by loss of the second spermatheca.

Just as *Palisa* has affinities with the favorinid *Noumeaella rehderi,* so *Learchis* may be related to favorinids such as *Rizzolia lineata* (Eliot) which has a penial gland which is somewhat similar to that of *L. poica* (Baba, 1964). Unfortunately, the penial gland of *L. indica* Bergh (the type of the genus *Learchis*) is not known (Bergh, 1896). Thus until further details are available on the reproductive systems of cleioproct eolids, I continue to separate the Facelinidae from the Favorinidae on the basis of the branching of the anterior liver.

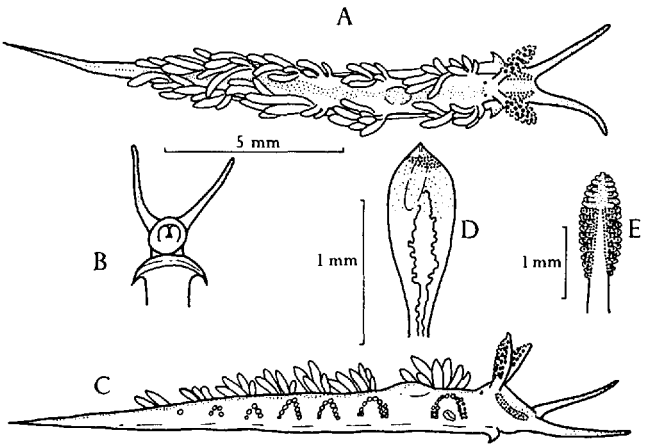

FIGURE 7. *Berghia verrucicornis* (A. Costa). A, living animal, in dorsal view; B, same, in ventral view; C, same, in lateral view, with right cerata omitted; D, ceras; E, rhinophore, in anterior view. Fine stipple indicates white pigment, coarse stipple indicates vermilion.

Family Aeolidiidae
Berghia verrucicornis (A. Costa)
Figs. 7; 8; 9

Occurrence.—One animal found on a rock dredged from 10 meters off Tema, January 22, 1965.
Further Distribution.—Atlantic and Mediterranean coast of Europe (Tardy, 1962).

Description.—The living animal is 15 mm long, including a finely pointed tail of 4 mm. The rhinophores are 2 mm, the oral tentacles 3.5 mm, and the longest cerata 2.5 mm. The body colour is translucent grey. The oral tentacles have the distal two-thirds white. The rhinophores are hyaline at the base and up the front, but the sides and posterior papillae are vermilion (Fig. 7, E). The tip and the distal papillae are cream. A vermilion streak runs from the base of the rhinophore to the base of the oral tentacle on either side, and the area between these streaks is white because the buccal organs show through the epidermis (Fig. 7, A, C). There is a mid-dorsal white line running from the eyes to the tail tip, widening between the groups of cerata, and broken in the tail region. The foot is rounded anteriorly, with short corners; the margin appears white, due to the presence of glands (Fig. 7, B). The cerata are translucent grey, but the cnidosac is just discernible through the epidermis. The liver is pale brown. There is a vermilion ring below the tip of the ceras,

TABLE 1

THE CHARACTERS OF WEST ATLANTIC AND GHANAIAN *Berghia* COMPARED WITH EUROPEAN *B. coerulescens* AND *B. verrucicornis*

Character	*B. coerulescens*	*B. verrucicornis*	Ghanaian animal	Brazilian animals	Jamaican A	Jamaican B	Jamaican C
Breadth as per cent of length	7–8	15	9	15–25	13	15	16
Body length, alive (mm)	44–70	16–30	15	12–20	40	12	13
Number of ceras groups	15–16	10	8	6–10	11	8	8
Number of cerata on each side	220–260	55–75	63–71	74	99–110	31–41	69
Number of denticles on radular tooth	50–80	34–48	44–48	24–46	74–98	40–64	
Egg coil (simple or corrugate spiral)	corrugate	simple		corrugate	simple		
Colour:							
Body	bluish white	grey	grey	bluish white	grey	grey	grey
Dorsal white line	absent	present	present	present	absent	present	absent
Base of oral tentacle	red	grey	grey	red	orange	orange	orange
Rhinophore papillae	white	red	orange		orange	orange	orange
Orange ceras insertions	present	absent	absent	present	present	present	present
Ceratal epidermis	bluish	grey	grey		bluish	grey	grey
Ring over cnidosac	gold or red	orange-red and white	orange and white	red	yellow	orange and white	orange, or yellow, or white

broadest anteriorly and often incomplete behind (Fig. 7, D). It is often underlain anteriorly with cream pigment which forms a crescent between the vermilion and the tip of the ceras. The distal third or half of the ceras is densely glandular and may be iridescent. The liver ducts are just visible through the body of the animal. When prodded with forceps, the animal ejected nematocysts from the cnidosacs, as do other *Berghia* (Edmunds, 1966).

There are 134 cerata arranged as shown in Fig. 7, C. Further details are given in Table 1.

The radula has 13 teeth with three more in process of formation. The teeth and jaws (Fig. 9, A, B, C) resemble those figured by Tardy (1962).

Discussion.—Tardy (1962) shows that the South European *Berghia* can be separated into two species which differ in color, anatomy, and habits. These differences are summarized in Table 1, and it is clear that the Ghanaian animal belongs to *B. verrucicornis.* The only feature in which it differs from *B. verrucicornis* and resembles *B. coerulescens* (Laurillard) is in its general shape. It is long and slender, with a long tail, whilst typical *B. verrucicornis* is much broader and has a short tail. The identity of the *Berghia* from Morocco (Pruvot-Fol, 1953) remains uncertain. Of the two figures she gives, one could be *B. coerulescens,* the other could be *B. verrucicornis,* but it is also possible that they belong to a single species. When *B. coerulescens* and *verrucicornis* have been studied from further localities, the range of variation found by Tardy (1962) may have to be extended.

West Atlantic specimens of *Berghia* have been considered to belong to a single, very variable species, *B. coerulescens* (Engel, 1925; Marcus, 1957; Edmunds, 1964), but they have not been re-examined since Tardy (1962) demonstrated that in South Europe there are in fact two species of *Berghia.* Table 1 gives some of the characters of Brazilian *Berghia* as described by Marcus (1957). Six of these agree with *verrucicornis,* five with *coerulescens.* I have therefore examined my Jamaican material (Edmunds, 1964) in greater detail, in an attempt to allocate Caribbean *Berghia* to their correct species. Most of the measurements and other details given in Table 1 are omitted from the following description.

JAMAICAN *Berghia*

Description of Specimen A.—Found in a tank at the marine laboratory, Port Royal, November 7, 1961. Body silvery grey, suffused with orange dorsally. Distal half of oral tentacles yellow, basal half grey ventrally, orange dorsally. Distal half of rhinophores yellow, bulb clear, basal papillae and basal part of anterior surface orange (Fig. 8, A). The ceras insertions are marked with bright orange. The liver in the cerata is dark brown or blackish; the ceratal epidermis is violet-grey with a yellow ring in the cnidosac region (Fig. 8, D). The distal third of the ceras is very glandular (Edmunds [1966] gives details of these glands). The radula has 23 rows with one developing tooth. The egg coil is a simple spiral of 5 turns, 1.75 mm in diameter.

Description of Specimen B.—Found amongst mangroves at Port Royal, February 6, 1962. Body greyish, with a white line running from the forehead to the tail tip (Fig. 8, B). Oral tentacles with the distal two-thirds cream, the base orange on the outer surface. Rhinophores with transparent bulb, papillae in the basal half orange, tip creamy white. Bright orange marks are present at the ceras insertions and others connect between the rhinophores and the oral tentacles. The liver is pale buff or greyish

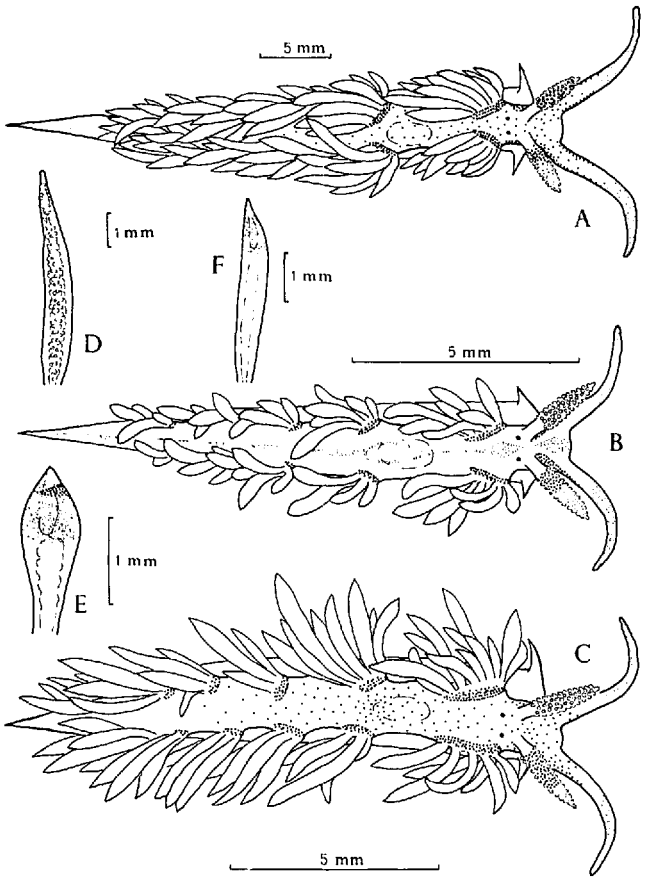

FIGURE 8. *Berghia*, specimens from Jamaica. A, specimen A, in dorsal view; B, specimen B, in dorsal view; C, specimen C, in dorsal view. In A-C, the tubercles are indicated on the left rhinophore, the colour on the right; fine stipple indicates white or yellow pigment (see text), coarse stipple indicates orange. D, ceras of specimen A; fine stipple indicates yellow pigment. E, ceras of specimen B; fine stipple indicates white or yellow pigment (see text), coarse stipple indicates orange. F, ceras of specimen C; fine stipple indicates white or yellow or orange pigment.

yellow; the ceratal epidermis is grey. There is an orange crescent which lies in a pale yellow ring anteriorly at the ceras tip. Below this is a broad white band (Fig. 8, E). The jaw is very narrow (Fig. 9, E). There are 16 rows to the radula with one developing tooth (Fig. 9, D).

Description of Specimen C.—Found amongst mangroves at Port Royal, March 6, 1962. Front half of body orange, rear half grey. Oral tentacles

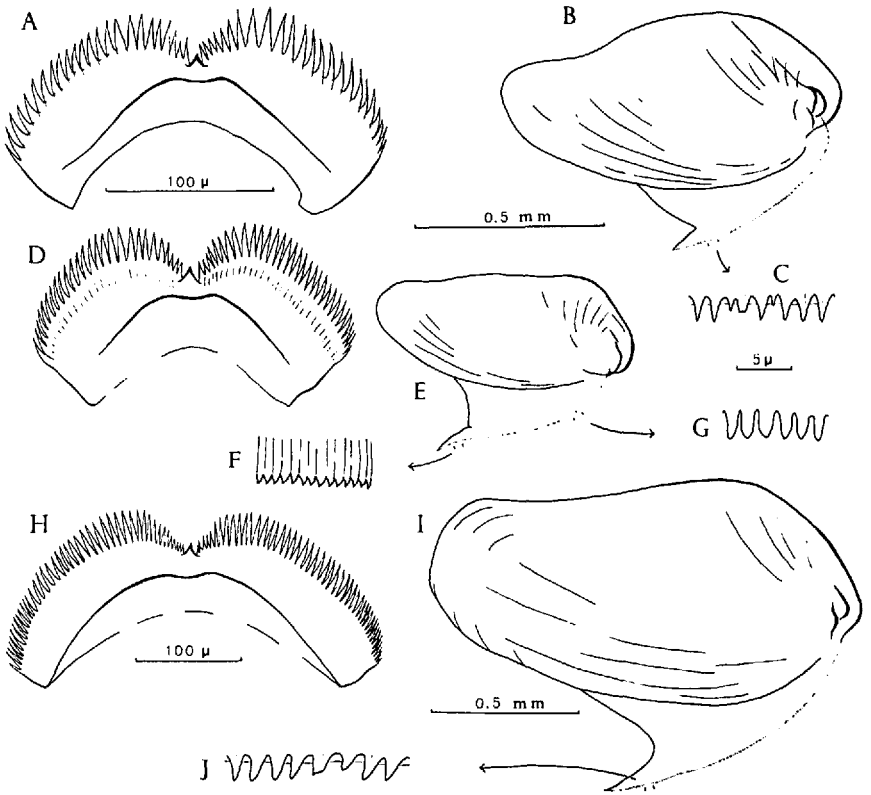

FIGURE 9.—A-C, *Berghia verrucicornis* (A. Costa), from Ghana: A, 11th radular tooth; B, jaw; C, detail of cutting edge of jaw.—D-G, *Berghia,* specimen B from Jamaica: D, 12th radular tooth; E, jaw; F and G, details of cutting edge of jaw.—H-J, *Berghia,* specimen A from Jamaica: H, 17th radular tooth; I, jaw; J, detail of cutting edge of jaw. (C, F, G, and J are all drawn to the same scale.)

with distal half cream, middle quarter grey, basal quarter orange (Fig. 8, C). Rhinophores with clear bulb, middle half including papillae orange, tip cream. Foot with a slight notch (there is no notch in specimens A and B). Ceras arches lined with bright orange. Liver pale olive-green; ceratal epithelium grey. The cnidosac is white, and there is a ring in the cnidosac region of white, orange, or creamy yellow. The radula was not examined.

Discussion of Jamaican Berghia.—Specimen B from Jamaica agrees with European *Berghia verrucicornis,* except that it has rather more orange pigment; specimen C differs slightly more; the Brazilian animals are approximately mid-way between typical *coerulescens* and typical *verruci-*

cornis; specimen A from Jamaica agrees with typical *coerulescens* except in its egg coil and two other characters. This assessment gives equal weight to all characters studied, regardless of whether they may be independent or correlated. The West Atlantic material can be interpreted in two ways. First, it is possible that there is a single West Atlantic species of *Berghia* which is very variable. This species cannot be given the name *coerulescens,* since Tardy (1962) has shown that in Europe *coerulescens* and *verrucicornis* are quite distinct, with no intermediate forms between them. Second, it is possible that there are two or more species of West Atlantic *Berghia,* each as distinct as are the two European species. It is not possible yet to decide whether any of these species can be considered identical with *coerulescens* or *verrucicornis,* nor whether new names will have to be given. I do not propose to erect any new species on the basis of the specimens described here, since this would probably lead to confusion, should later research prove that I have overlooked the most important specific characters. It is better to wait until more material is available, with full details of the variation in the living animal and its internal anatomy.

Zoogeography and Speciation

The forms most closely related to the three species of eolid described here from Ghana are found in the West Atlantic in two cases, and in Europe in one. Even this one (*Berghia verrucicornis*) has closely related forms in the West Atlantic. Many boats go between West Africa and Europe, but comparatively few go directly between Africa and tropical America, so this distribution is probably not due to recent immigration aided by man. A floating tree trunk carrying hydroids could easily transport a colony of eolids, just as *Tergipes despectus* (Johnston) has apparently travelled across the Atlantic on ships (Marcus, 1957). The process of speciation following the Atlantic crossing has evidently proceeded further in *Catriona,* where the eastern and western forms appear to be specifically distinct, than in *Learchis poica,* where they remain indistinguishable.

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Sumario

Moluscos Eolidos de Ghana, con mas Detalles sobre las Especies del Atlantico Occidental

Se describen tres especies de nudibranquios eólidos de Ghana. *Catriona tema* n. sp. está muy relacionada con la especie del Caribe *C. maua* Marcus

& Marcus, pero difiere en color, número de ceratas, número de dientes radularios y en detalles de los órganos reproductores.

Learchis poica Marcus & Marcus de Ghana casi no es distinguible de los ejemplares del Caribe.

Berghia verrucicornis (A. Costa) de Ghana es muy similar al material de Europa.

Son re-examinados ejemplares de *Berghia* del Atlántico Occidental en un intento para decidir si deben ser colocados como *B. coerulescens, B. verrucicornis* u otra especie, pero se requiere más material para poder hacer ésto de un modo satisfactorio.

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